

Entomology and Plant Quarantine, has checked the determination of the adult female and larva of *F. minima*. One adult, one pupa, and one larva have been deposited in the collections of the U. S. National Museum and the Communicable Disease Center, Atlanta, Ga. The drawings were made by C. J. Stojanovich.

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ZOOLOGY.—*Bostrichobranchnus digonas*, a new molgulid ascidian from Florida.

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The common American east-coast ascidian *Bostrichobranchnus pilularis* (Verrill), 1871, has a single gonad, situated on the left side of the body. Van Name (1921) reported examining a single specimen of this species, taken in St. George Sound, Fla., which was "unique in having a gonad on each side of the body." This unique specimen has been commented on (but not re-examined) by Hartmeyer (1923), Ärnäck (1928), and Van Name (1945), all of whom have regarded it either as a reversion to an ancestral 2-gonad condition or as an individual aberration. Were it not for new evidence, presented below, the present writer would concur with the above treatment of this specimen.

Recently an opportunity arose to examine a series of specimens found stranded on the sandy beach along the Peace River estuary, Charlotte Harbor, Fla., about 20 miles from the Gulf of Mexico. According to the collector, J. C. Galloway, of Punta Gorda, Fla., the stranded ascidians formed a belt on the shore 4 to 6 inches wide and about 100 yards long, and included many thousands of individuals. Twenty-one specimens of the collection, as well as supplementary and comparative materials, were placed at my disposal for study through the kindness of Dr. Fenner A. Chace, Jr., of the Division of Marine Invertebrates, United States National Museum. Investigation of the 21 individuals from Charlotte Harbor, all of which bore two gonads, and re-examination of Van Name's unique specimen from St. George Sound show that these ascidians

represent a previously undescribed species of *Bostrichobranchnus*, closely related to *B. pilularis* but unequivocally distinct from it.

#### Class ASCIDIACEA

#### Order STOLIDOBRANCHIA

Family MOLGULIDAE Forbes and Hanley, 1848

#### *Bostrichobranchnus digonas*, n. sp.

*Bostrichobranchnus pilularis* Van Name, 1921, p. 478 (only the specimen from St. George Sound, Fla., with a gonad on each side of body); 1945 p. 441 (only the specimen from St. George Sound, Fla., with a gonad on each side of body).

*Dimensions*.—For 12 well-expanded, turgid specimens the external dimensions of the tunic (here, as elsewhere, the mean is followed by the range in parentheses) were: Height 17 (12-20) mm; length 18 (15-20) mm; width 7 (4-10) mm.

*External appearance*.—Body oval and somewhat laterally compressed, the siphons rather short and contracted in most specimens; tunic almost completely free of sand, mud, and other debris, its surface relatively smooth and bearing scattered small tendrils, or minute papillae probably representing broken tendrils (specimens were washed ashore and probably somewhat worn externally); tunic membranous and free of wrinkles in most areas, somewhat thicker and bearing circular wrinkles on and about the bases of the siphons.

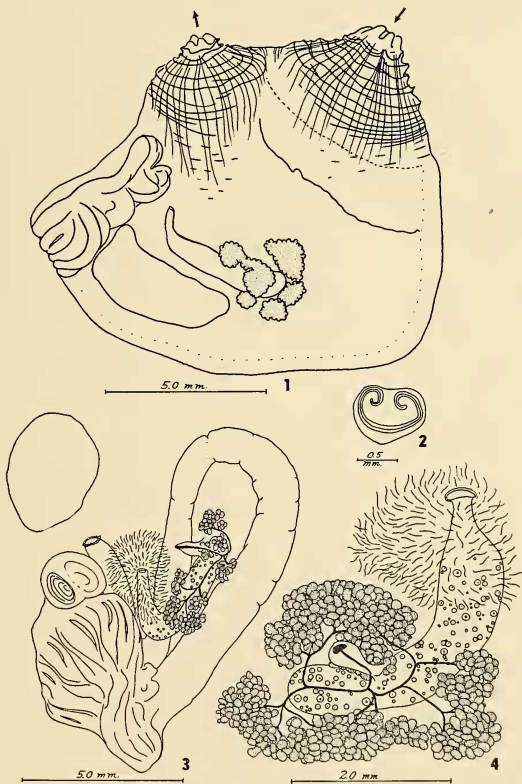
*Apertures*.—Oral aperture with six lobes, atrial aperture with four.

*Mantle*.—Thin, delicate, and transparent in most areas; muscle fibers arranged into conspicuous bundles only on the siphons, where they constitute the radial and circular muscles (Fig. 1);

radial or siphon retractor muscles consist of stout bundles running along the siphons to terminate at or slightly below their bases; a single individual out of 22 examined bore radial muscles grouped into thick bands corresponding with the lobes of the apertures; circular or siphon constrictor muscles present, these, when contracted, creating one or more distinct circular grooves around each siphon; a short series of transverse bundles overlies the dorsal intersiphonal area; occasional bundles occur elsewhere, laterally and ventrally, but these are generally so small, few in number,

widely separated, and inconspicuous as to be easily overlooked.

*Tentacles*.—Compound to branches of the third order on the largest tentacles; two-thirds of 18 individuals examined showed only three orders of tentacles, one-third possessed small fourth order tentacles as well; total number of tentacles, counting all four orders = 23 (17-34), counting only three orders = 20 (13-29); basic number of tentacles of each order apparently either 5-5-10 or 6-6-12, the alternatives appearing in about equal numbers; distribution pattern basically



FIGS. 1-4.—*B. digonas*, n. sp.: 1, With the tunic removed, viewed from the right side; 2, dorsal tubercle; 3, medial view of digestive tract, left gonad, and atrial aperture; 4, medial view of right gonad.

-1-3-2-3-1- where three orders are present, and -1-4-3-4-2-4-3-4-1- where four orders occur; regularity of this pattern varies from perfect to rather poor, but pattern is regular in at least parts of the tentacular rings of all specimens.

*Dorsal tubercle.*—In 21 specimens examined the aperture was a U-shaped slit, with the horns sufficiently inrolled to form approximately a full circle at either end of the slit (Fig. 2); open interval directed anteriorly and usually inclined slightly toward the left.

*Dorsal lamina.*—Rather narrow anteriorly, gradually broadening posteriorly and passing some distance to the left of the esophageal opening to terminate near the "hepatic" region of the stomach; free margin smooth or slightly undulating; internal longitudinal vessels of the left side curve medially and join the base of the lamina.

*Pharynx.*—Without folds, but always with seven ribbonlike internal longitudinal vessels and five transverse vessels on each side; pharyngeal wall bearing many spirals varying from small, flat coils to very elongate, conical infundibula; each infundibulum composed of two uninterrupted, spirally intertwined stigmata separated at the apex; each stigma on the more elongate infundibula coiled six to eight turns; spirals generally about 15 (7-29) per mesh for the central fields between fifth and seventh internal longitudinal vessels (based on 85 fields counted in 17 specimens); infundibula numerous and irregularly distributed in all individuals examined, making it very difficult to distinguish primary and accessory spirals with any certainty.

*Digestive tract.*—Esophageal aperture situated about halfway posteriorly on the pharynx; esophagus short; stomach in two divisions, an upper globular portion communicating with esophagus and intestine and bearing seven or eight doubled and somewhat irregular folds as seen from its medial surface, and a lower portion, twisted posteriorly to form a small, blind "hepatic" sac ventral to the main gastric chamber; intestine forms a rather small, open primary loop, the descending limb returning to contact the proximal intestine and the rectum rising in contact with the stomach; rectum terminates near the branchio-esophageal junction in an anus whose margin bears numerous small and often irregularly distributed teeth.

*Renal organ.*—Bean-shaped, lying posteroventral to the gonad on the right side, its posterior end contacting the stomach wall.

*Gonads.*—Each of the 22 specimens examined bore a complete set of reproductive organs on each side of the body, the left gonad lying largely in the primary intestinal loop (Fig. 3); ovary on either side tubular in outline, narrowing at its posterior end into a short oviduct directed toward the atrial aperture; inner surface of mantle in the vicinity of the oviducal aperture bears a conspicuous circular path of delicate tendrils (Figs. 3, 4) probably aiding in the retention of eggs and embryos which are brooded in the atrial cavity; male glands arranged about the margin of each ovary, in a series of two to twelve clusters of lobulate testes; clusters may be clearly separated or sufficiently closely placed to form a more or less continuous border about the more anterior portions of each ovary; efferent ducts from each cluster of testes join those of adjacent clusters and run centripetally to the base of the single, large common spermatic duct which rises from near the center of the medial wall of each ovary to project freely as an erect, elongate, finger-like process into the atrium (Figs. 3, 4); in a single specimen the common spermatic duct of the left side was bifurcate; eggs present in the atria of all specimens from Charlotte Harbor (collected January 29, 1938), lying free or enmeshed in the mantle tendrils about the oviduct; eggs encased within 12- or 14-sided polyhedral membranes (whether this shape is natural or the result of preservation is uncertain); diameter of egg within polyhedral casing 0.19 (0.17-0.21) mm; atria in a few individuals contain embryos and other stages up to young prefunctional oozoids; tadpole stage absent in development.

*Specimens examined and compared* (all deposited in the U. S. National Museum), as follows:

*B. digonas*: 1 type and 20 paratypes, found stranded on the beach along the Peace River estuary, Charlotte Harbor, Fla., about 20 miles from the Gulf of Mexico, roughly at lat. 26°58' N., long. 82°02' W., U.S.N.M. nos. 10976 (holotype) and 10977-10978 (paratypes). One specimen, from St. George Sound, Fla., U.S.N.M. no. 7242 (this is the specimen with two gonads referred to by Van Name, 1921 and 1945).

*B. pilularis*: 11 specimens, from off Marthas Vineyard, 63 fathoms, U.S.N.M. no. 4940. Seven specimens, from Long Island Sound, 8 fathoms, U.S.N.M. no. 5014. One specimen, from off northwest end of St. Martins Reef, Florida banks, near lat. 28°50' N., long. 83° W., U.S.N.M. no. 7229. One specimen, from off Georgia, 10 fathoms, lat.

Feature	<i>B. digonas</i>	<i>B. pilularis</i>
Mantle musculature	Muscle bundles absent laterally and along endostyle, or if present very sparse, weak, and inconspicuous.	A row of short, stout, numerous, and conspicuous muscle bundles present on each side of body along endostyle and running at right angles to latter; a series of short muscle bundles running parallel with the circular muscles of the siphons extends downward on each side of body from atrial siphon.
Dorsal tubercle	With the horns of the slit inrolled approximately one full turn at each end.	With horns of the slit not incurved save in large individuals, and here not inrolled a full turn at each end.
Gonads	<p>Always present on both sides of body.</p> <p>Anterior closed end of left ovary reaching only half to two-thirds of the way up to inner peak of primary intestinal loop.</p> <p>Testes usually arranged in separate clusters; these are sometimes closely apposed to form a more or less continuous series about the more anterior portions of oviduct.</p> <p>Inner surface of mantle surrounding oviducal aperture bearing a conspicuous circular patch of fine tendrils.</p> <p>Efferent ducts from clusters of testes run centripetally and unite to form a single, erect, fingerlike common spermatid duct projecting freely into atrial cavity on each side.</p>	<p>Present only on left side of body.</p> <p>Anterior closed end of left ovary reaching to, or almost to, inner peak of primary intestinal loop.</p> <p>Testes arranged in a continuous row about whole margin of ovary, never grouped into distinct clusters.</p> <p>Mantle in area adjacent to oviducal aperture smooth and unmodified.</p> <p>Efferent ducts from testes extend across tubular ovary to join a long common spermatid duct, which runs prostrate along whole length of ovary and lies embedded in its medial wall; along its length this common duct bears about 10 (7-15) minute papillae, each of which terminates in an aperture for the discharge of sperm.</p>

32° N., long. 80°25' W., U.S.N.M. no. 10501.

*Specific diagnosis.*—The specific features distinguishing *B. digonas* from *B. pilularis*, the only other member of the genus, are tabulated above. In nearly all other respects, and particularly in regard to the detailed structure of the pharynx, the two species are so similar as to be nearly indistinguishable. The majority of differences concern the gonads, and the simplest method of distinguishing the species is by the presence or absence of a gonad on the right side. Both species have direct development without a tadpole larva.

*Discussion.*—*Bostrichobanchus* belongs to a small group of molgulid species sometimes called "eugyrids," which have the following characters in common: a branchial sac lacking folds, and

bearing five transverse vessels and five to seven ribbonlike internal longitudinal vessels on each side; a branchial wall bearing large spirals, often infundibulate, each of which is formed by two intertwined stigmata which are uninterrupted throughout their entire lengths but are generally separated apically; the left gonad, when present, is always placed largely or wholly in the primary intestinal loop. Attempts to subdivide this group into genera have centered around two features: the number and position of the gonads, and the presence and degree of development of secondary spirals on the pharynx.

On the basis of the number and location of the gonads alone, three eugyrid genera are sometimes recognized: *Gamaster*, with a single gonad on the right side of the body; *Eugyra*, with a single

gonad on the left side; and *Eugyroides*, with two gonads, one on each side of the body. Hartmeyer (1911), Huntsman (1922), and Årnbäck (1928) recognized all three genera. Huus (1937) recognized the three groups as subgenera under the genus *Eugyra*. Michaelsen (1915), Hartmeyer (1923), and Van Name (1945) united the three genera under *Eugyra*. (Van Name, 1945, actually made no mention of *Gamaster*, but by implication this group would not receive generic status in his classification.) Michaelsen (1915) and Hartmeyer (1923) were unable to find other characters to justify segregating *Eugyra* (*sensu lato*) into three genera, and concluded that differences in mere number and position of the gonads were of specific rather than generic caliber. This conclusion appears to be reinforced by the finding of the new *Bostrichobranchus* which differs from *B. pilularis* most conspicuously in its possession of a gonad on the right side.

The second character that has been used in subdividing the eugyrids into genera is the presence and degree of development of secondary spirals on the pharynx. In molgulids, stigmata arranged in spirals which lie on the pharyngeal folds or are crossed by and closely associated with the internal longitudinal vessels are called primary spirals. Any spirals which may develop on the flat areas between folds, or, where folds are absent, between the internal longitudinal vessels and their rows of associated primary spirals, are termed secondary or accessory spirals. Accessory spirals are known to occur in some species of the molgulid genera *Molgula*, *Rhizomolgula*, *Paraeugyroides*, *Bostrichobranchus*, *Eugrya* (= *Eugyra* + *Eugyroides* + *Gamaster*), and probably *Paramolgula*. In all these genera except *Bostrichobranchus* the accessory spirals, when present at all, are small, even in older individuals, though in *Rhizomolgula* they may form small conical infundibula. The single feature which clearly distinguishes *Bostrichobranchus* from other eugyrids is the relatively tremendous development and multiplication of the accessory spirals, such that in all but very young individuals it is nearly impossible to distinguish primary from secondary spirals with any certainty. This condition is not even remotely approached in any other species possessing secondary spirals. In its development, however, the pharynx of *B. pilularis* passes through a stage which closely resembles the adult condition of most *Eugyra* species (Van Name, 1912), suggesting the derivation of *Bostrichobranchus* from an ancestral *Eugyra*-like form.

Hartmeyer (1911) recognized two species of *Bostrichobranchus*, *B. manhattensis* Traustedt, 1833, and *B. molguloides* Metcalf, 1900. Van Name (1912) showed these to be conspecific with *Molgula pilularis* Verrill, 1871, but retained Traustedt's genus *Bostrichobranchus* for this species. Since this work, *Bostrichobranchus* has received recognition as a full genus by Hartmeyer (1923), Huus (1937), and (with some reluctance) Van Name (1945). Huntsman (1912) pointed out the similarities of this genus with *Eugyra* and included it in the latter with the reservation that "it might be well to retain *Bostrichobranchus* as a subgenus, if there prove to be species more closely related to *E. pilularis* than to the typical members of the genus . . ." Årnbäck (1928) pointed out that secondary infundibula were not unique in *B. pilularis*, and included this species in *Eugyra*. Van Name, who has studied *B. pilularis* more thoroughly than any other worker, concluded (1945) that *Bostrichobranchus* "is so close to the latter [*Eugyra*] that Huntsman's course has much to recommend it, but nevertheless the remarkable development of the accessory infundibula in the present group represents a distinct advance step in the evolution and specialization of the branchial sac which seems worthy of recognition in classification." He lists *Bostrichobranchus* as "Genus or Subgenus," giving preference to the former.

If segregation of *Bostrichobranchus* as a separate genus is suggested on the basis of one species, *B. pilularis*, such action appears to be much more strongly indicated with the discovery of the second and closely allied species *B. digonas*. Were the system of subdividing the eugyrids into genera on the basis of number and position of gonads followed here, it would be necessary to place *B. pilularis* in the genus *Eugyra* and *B. digonas* in *Eugyroides*. In view of the close structural similarity of the two species, such a generic separation would be untenable.

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## PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

### ANTHROPOLOGICAL SOCIETY

The Anthropological Society of Washington at its annual meeting on January 16, 1951, elected the following officers: President, WALDO R. WEDEL; Vice President, GEORGE M. FOSTER, Jr.; Secretary, WILLIAM H. GILBERT Jr. (reelected); Treasurer, MARGARET C. BLAKER (reelected); Councilors to the Board of Managers, CORNELIUS J. CONNOLLY (reelected), MARK HANNA WATKINS (reelected), MARION L. VANDERBILT, SIDNEY ADAMS, GEORGE TRAGER, JOHN C. EWERS; Representative to the Washington Academy of Sciences, WALDO R. WEDEL.

A report of the membership and activities of the Society since the last annual meeting follows: Life members, 1; Active members, 75; Associate members, 14; Total, 90. This represents a decrease of 7 since last year.

The members elected during the year were: Active members; Dr. GORDON MACGREGOR. Associate members; Dr. DAVID F. ABERLE, ROY G. BLANCK, JOSEPH B. CASAGRANDE, Miss ANNE FORBES.

The report of the Treasurer for the year ended December 31, 1950, follows:

#### Credit:

Cash in bank	\$282.31
Income:	
Dues collected	\$95.00
Interest, Perpetual Building Association	\$60.60
Dividend, Washington Sanitary Improvement Co.	\$10.50
Dividends, Washington Sanitary Housing Co.	\$16.00
Interest, U.S. Savings Bond	\$12.50

Sales of old series <i>Anthropologists</i>	\$18.71
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Total	\$213.31
	\$495.62

#### Debit; Expenditures:

AAA dues paid for Secretary, Treasurer, and one life member	\$15.00
Dues forwarded to AAA	\$10.00
Dues check returned for lack of funds	\$6.00
Speakers' expenses	\$119.00
Printing and mailing notices	\$48.07
Secretary's expenses (postage)	\$3.29
Treasurer's expenses (postage)	\$1.00

Total	\$202.36
Balance (in bank)	\$293.26

#### Assets:

Funds invested in Perpetual Building Association	\$2,000.00
2 shares Washington Sanitary Housing Co. (par value \$100 per share)	\$200.00
Sale of 42 shares @ \$32 per share, Washington Sanitary Improvement Co. (less \$3.15, expenses) authorized by Board of Managers February 14, 1950	\$1,340.85
U.S. Savings Bond, Series G	\$500.00
Cash in bank	\$1,634.11
Total as of Dec. 31, 1950	\$5,674.96
Total as of Dec. 31, 1949	\$2,272.65